

Bilayered vascular graft derived from human induced pluripotent stem cells with biomimetic structure and function.

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Public Summary:

Background: We developed an aligned bi-layered vascular graft derived from human induced pluripotent stem cells (iPSCs) that recapitulates the cellular composition, orientation, and anti-inflammatory function of blood vessels. Materials & methods: The luminal layer consisted of longitudinal-aligned nanofibrillar collagen containing primary endothelial cells (ECs) or iPSC-derived ECs (iPSC-ECs). The outer layer contained circumferentially oriented nanofibrillar collagen with primary smooth muscle cells (SMCs) or iPSC-derived SMCs (iPSC-SMCs). Results: On the aligned scaffolds, cells organized F-actin assembly within 8° from the direction of nanofibrils. When compared to randomly-oriented scaffolds, EC-seeded aligned scaffolds had significant reduced inflammatory response, based on adhesivity to monocytes. Conclusion: This study highlights the importance of anisotropic scaffolds in directing cell form and function, and has therapeutic significance as physiologically relevant blood vessels.

Scientific Abstract:

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